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May 6, 1999

Via Hand Delivery

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Twelfth Street Lobby, TW-A325
Washington, D.C. 20554

Re: Notification of *Ex Parte* Contact in CC Docket No. 94-102

Dear Ms. Salas:

On May 6, 1999, Brian T. O'Connor and Beth Frasco of Aerial Communications, Inc., along with Scott Blake Harris and Evan Grayer of Harris, Wiltshire & Grannis met with Ronald Netro and Won Kim of the FCC's Wireless Bureau. The purpose of the meeting was to discuss Aerial's perspective on the Commission's E-911 Automatic Location Identification ("ALI") rules. In particular, Aerial addressed the costs and benefits of handset- and network-based ALI solutions, and stressed that the Commission should pursue a technology-neutral policy in implementing its ALI rules. That presentation is summarized by the attached slides.

Pursuant to section 1.1206 of the Commission's rules, two copies of this letter and the slides have been filed with your office. Please contact me with any questions.

Sincerely

Evan R. Grayer

Enclosures

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List A B C D E

Aerial Communications

Presentation of Waiver Application to FCC

May 6, 1999

Agenda

- About Aerial
- GSM and ALI LoCation Services (LCS)
- Overview of LCS available methods
  - Operation, implementation, cost
- Legacy Handsets
- Considerations for FCC

About Aerial

- PCS 1900 A&B block Licensee
- License for 28 million pops in 6 MTA's
  - Minneapolis, Columbus, Kansas City, Pittsburgh, Houston & Tampa
- 350,000 customers
- GSM technology
- In operation about 2 years
- 1200 Base Stations

About GSM and LCS

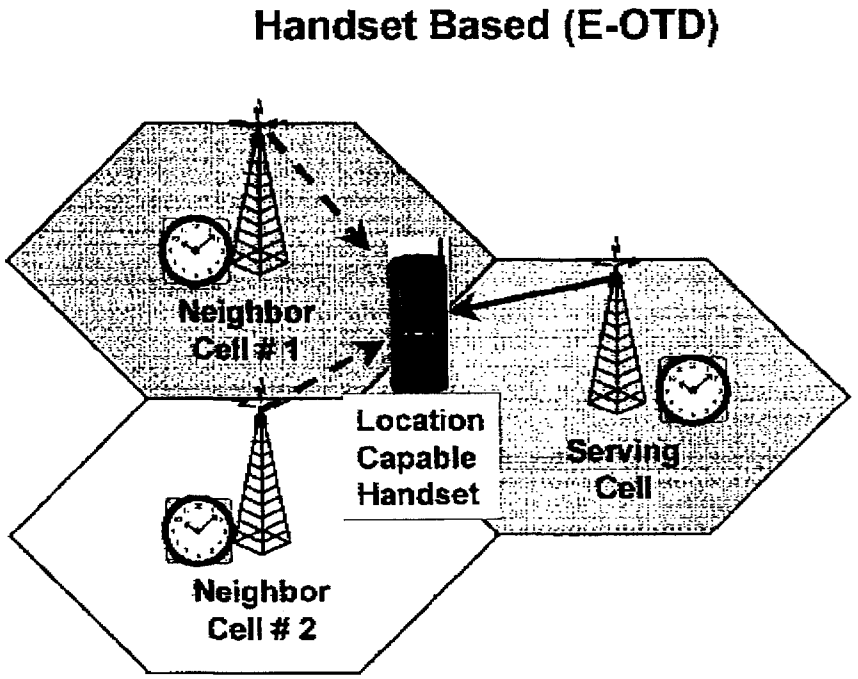
- Standardization:
  - T1P1.5 LCS sub-working group
  - Actively developing solutions since Sept 1997
- LCS options for GSM carriers
  - E-OTD (Enhanced Observed Time Difference)
  - GPS
  - TOA (Time Of Arrival)

LCS Option #1 - E-OTD

- Handset based solution
- Does not use GPS in handset
- LCS methodology provided for in GSM
- Enhancement to handset software required
- Offers enhanced functionality for E911
- Preferred by Aerial

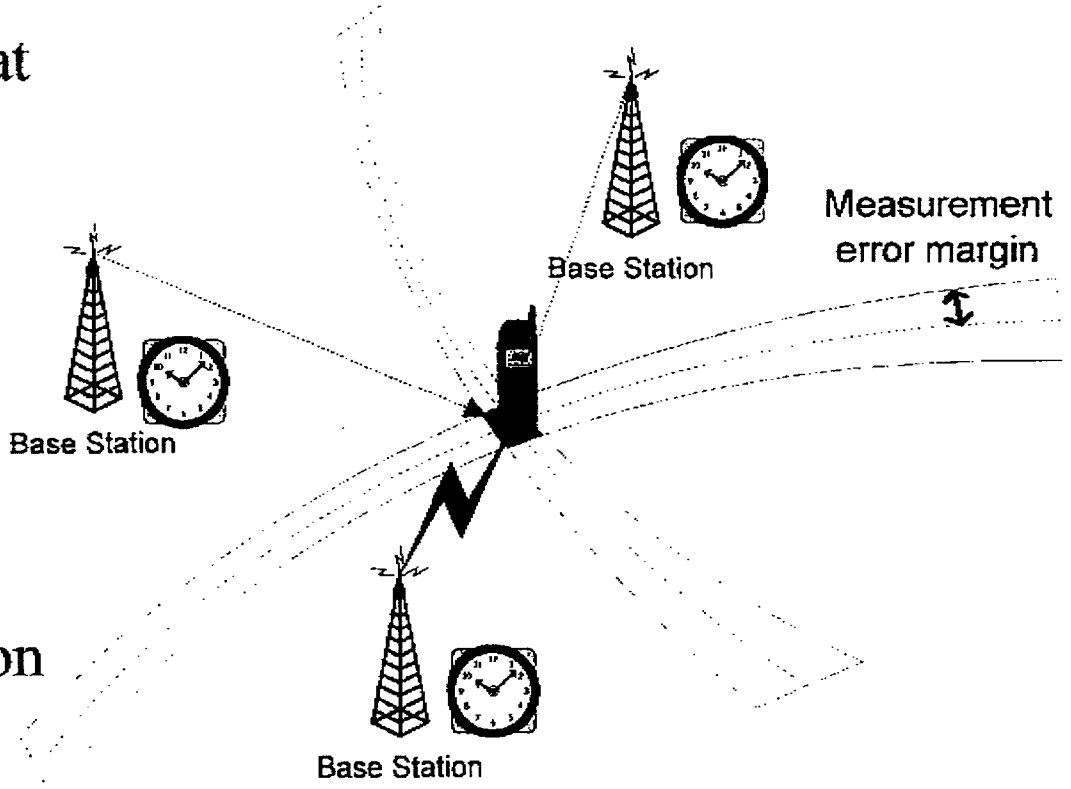
E-OTD - How it Works

- Mobile listens to sync bursts sent from neighboring base stations (already does this)
- Mobile reports burst arrival times
- Mobile's position is triangulated based on:
  - Known location of base stations
  - Delay of burst arrival from each base station
  - Timing difference of each base station

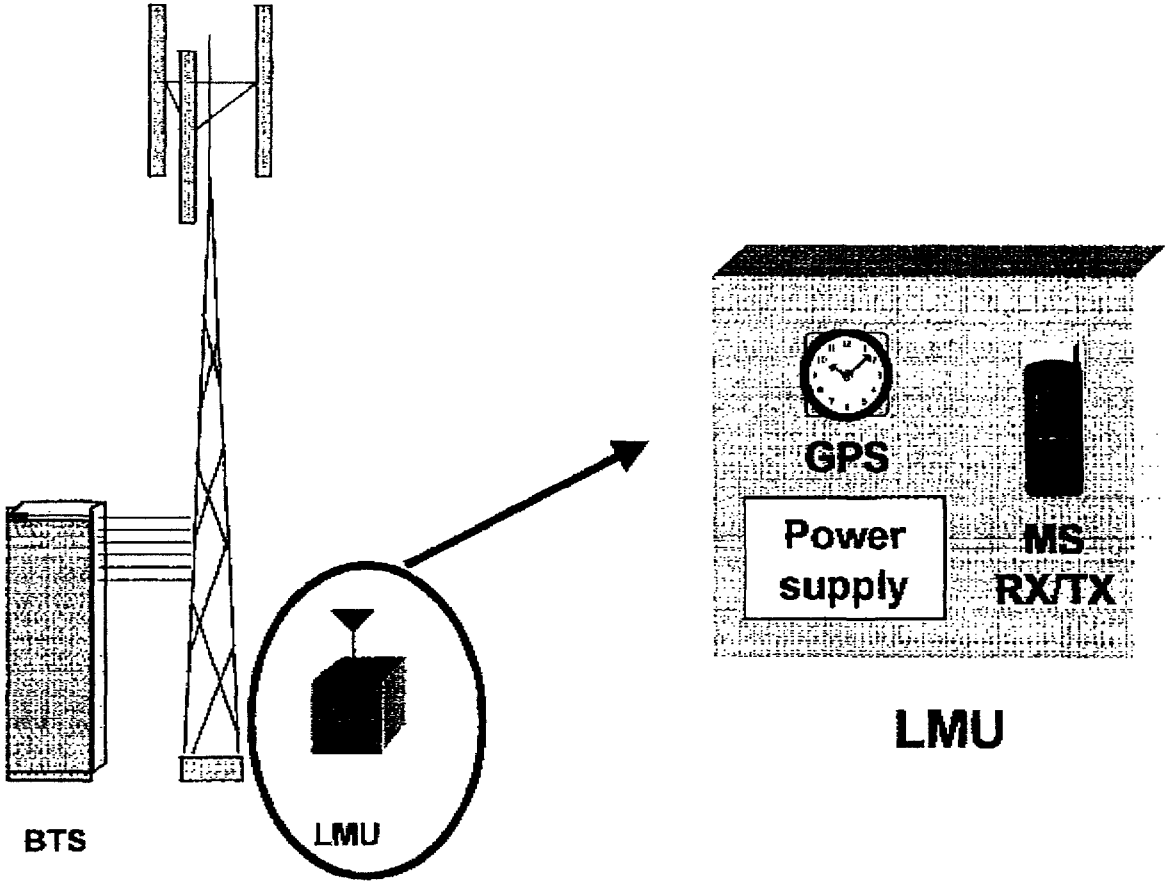


E-OTD - How it Works

- MS measures the OTDs of at least three base stations
- The base stations' timing differences (RTDs) are measured relative to a GPS clock
- Location estimate is based on Geometric Time Differences (GTD = OTD - RTD)



E-OTD - Hardware Implementation



Implementation Issues - E-OTD

- Small box at the site
- No RF antennas needed
- Siting requirements moderate for new site hardware

E-OTD Cost Issues

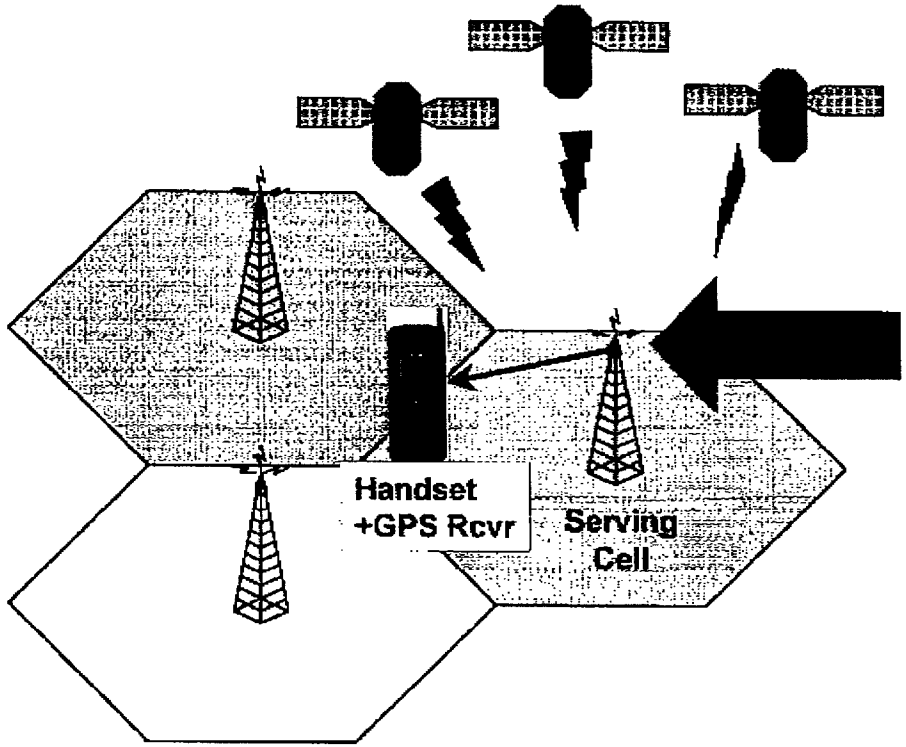
- Handset costs
  - No additional processing or memory required
  - Zero incremental costs
- Network hardware costs
    - Reduced by low complexity of equipment
- Installation costs
  - Reduced by equipment size & site requirements
- No additional hardware complexity

LCS Option #2 - GPS

- Unassisted GPS
- Other assisted GPS (e.g. Snaptrack)

Assisted GPS - How it works

- Network monitors GPS satellites
- Serving cell broadcasts assistance data
  - Ephemeris data
  - Timing data
  - Location of satellites
- Increased acquisition time
- Increased sensitivity



Implementation Issues - GPS

- Handset issues
  - Battery life
  - Antenna design
  - Size
  - Head loss and satellite visibility
- Networks needs facility to acquire assistance data and broadcast or distribute it

GPS - Cost Issues

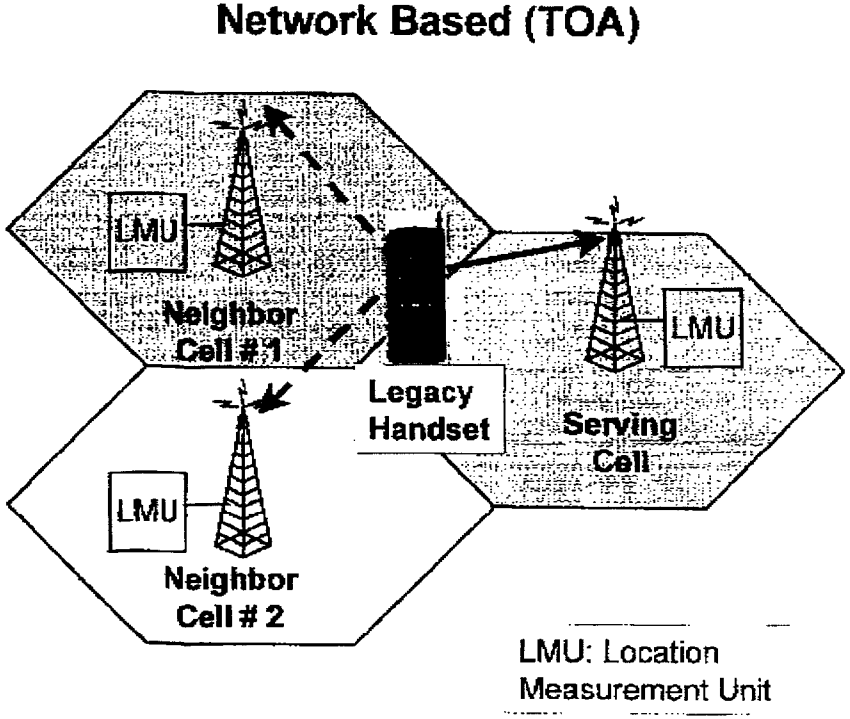
- High handset cost
- Economically unfeasible initially
- GPS will be an evolutionary step for other LCS technologies, both network and handset based

LCS Option #3 - TOA

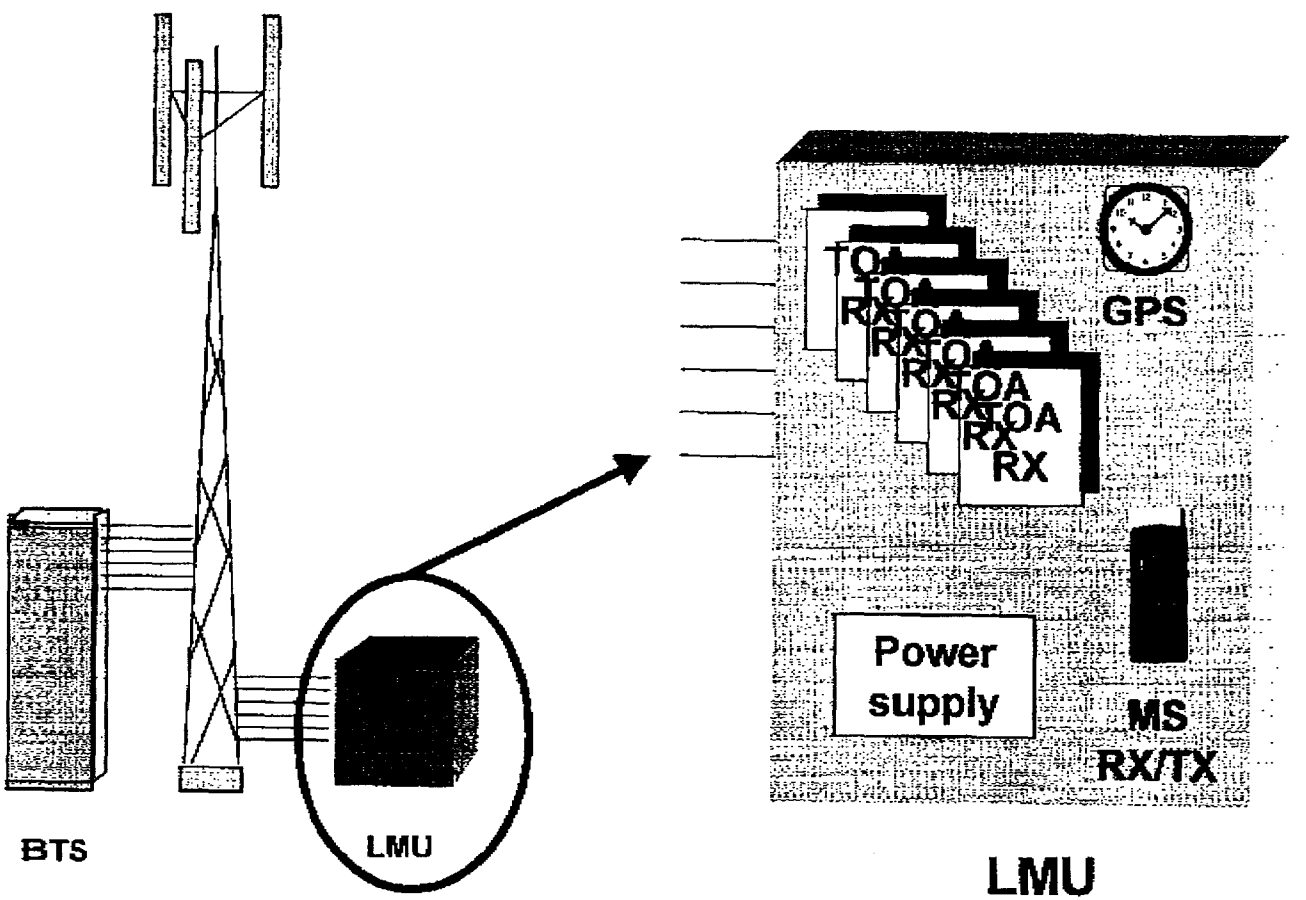
- Network based overlay solution
- Works for existing handsets
- Requires new, sophisticated receivers at every base station
- Requires considerable modification to existing sites

TOA - How it Works

- Network tells mobile to handover
- Mobile broadcasts handover access bursts
- Multiple "LMU"s listen for bursts
- Mobile's position is triangulated based on:
  - Known location of LMUs
  - Delay of burst arrival at each LMU
  - Timing reference of each LMU



TOA - Hardware Implementation



Implementation Issues - TOA

- Existing receivers cannot be used
- Separate box at the site
- Split existing or install new antennas and lines
  - Potential impact to system coverage
- Siting requirements considerable for new site hardware

TOA - Cost Issues

- Network hardware costs
  - Increased by number of receivers
  - Increased by performance required (complex)
- Installation costs
  - Increased by siting requirements
  - Increased by antenna and line requirements
- Increased network hardware complexity

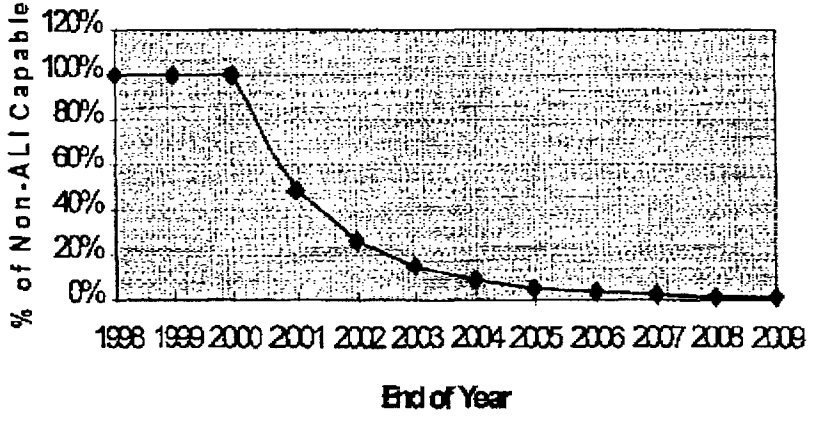
Accuracy of Methods

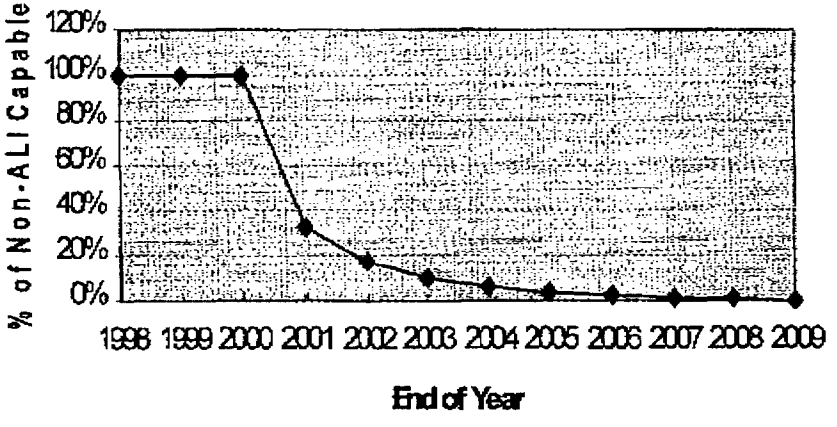
- Simulations show similar accuracy between TOA/E-OTD
- Improvements to accuracy over time due to:
  - Improved multipath algorithms
  - Coding improvements
  - Processing gains

Legacy Handset Issue

- GSM has unique abilities to handle legacy handsets
  - Timing advance
  - Existing info given on handover
  - For home and roaming legacy handsets
- This problem will dwindle quickly
  - Early availability, churn, growth, low legacy numbers

Legacy Handset Issue (cont.)

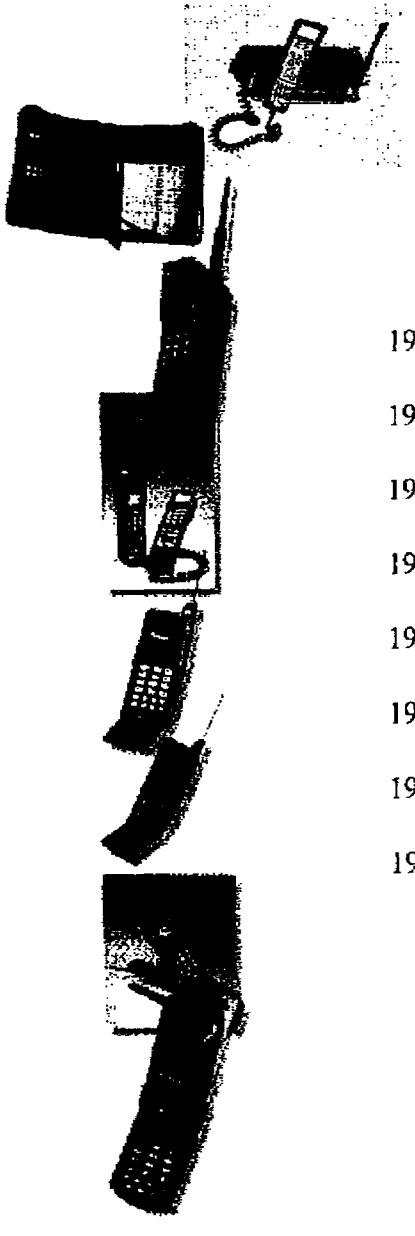




From Cellular/PCS Churn: a Carriers Worst Nightmare, Julie Reitman, p.18 (1998)

Handset vs. Network Lifecycles

- Five - ten years ago - handsets
  - Hand portables, brick phones, bag phones where are they now?
- Five - ten years ago - base stations
  - Early AMPS equipment still in operation



Handset Evolution

1973	First generation portable phone: DynaTAC Cellular Phone (weight 1089 g)
1983	First cellular car phone
1984	First cellular portable phone, the DynaTAC 8000XTM (weight 850 g)
1989	The MicroTAC Cellular Phone. A pocket-sized unit (weight 303 g)
1991	The MicroTAC alpha series phones, with a dot matrix display (weight 286 g)
1992	The MicroTAC Ultra Light with the Vibracall Alert features (weight 169 g)
1994	The MicroTAC Elite phone (weight 113 g).
1996	The StarTAC Wearable Cellular Phone (weight 95 g))

Handset vs. Network Lifecycles

- Five years from now - handsets
  - 18 product month life cycle
  - Additional applications and functionality (AMR, PDAs, GPS) will drive handset churn
  - Driven by consumer desires and applications
- Five years from now - base stations
  - 5+ year depreciation and useful life
  - Evolution is software driven
  - Replacement prohibited by economics

Considerations for the FCC

- Allow operators to deploy a range of solutions for E 911 phase II
- Be aware of range of solutions for operators
- Encourage the development and evolution of future LCS technologies
- Encourage competition among technologies and companies